



SENECA FIRE ENGINEERING, LLC

SUMMARY REPORT

FIRE SPRINKLER SYSTEM PERFORMANCE BUILDING FIRE

GWINNETT CLEAN & BEAUTIFUL
4300 SATELLITE BOULEVARD
DULUTH, GEORGIA

Prepared by:

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Seneca Fire Engineering, LLC
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Submitted to:

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February 28, 2013

EXHIBIT "B"

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Introduction

On October 6, 2011, a fire occurred at the Gwinnett Clean & Beautiful recycling facility located at 4300 Satellite Boulevard in Duluth, Georgia. The fire caused extensive damage to the structure and its contents. Origin and cause investigators determined that the fire was accidental and originated in a piece of machinery known as the Eddycurrent.

The recycling operation at Gwinnett Clean & Beautiful involves various process equipment and bins that are interconnected by conveyors at floor level and elevated above the plant floor. The Eddycurrent removes aluminum and other pieces of metal from the waste stream during recycling operations. The Eddycurrent itself is located above the plant floor at the end of one of the elevated conveyors. Selected photographs are provided in Appendix A.

A nominally 5-foot wide transfer conveyor located, in part, on a mezzanine structure traverses over the feed conveyor to the Eddycurrent. The fire originated at the Eddycurrent itself and spread to the obstructed area created by the overhead transfer conveyor. This obstructed area created by the transfer conveyor blocked the intended application of water from sprinklers at the ceiling level above which allowed the fire to spread unchecked to involve and heavily damage the conveyor belts and equipment in the obstructed area.

Gwinnett Clean and Beautiful was provided with an automatic fire sprinkler system intended to protect the entire recycling facility from fire in accordance with recognized codes and standards. The system was designed, installed, tested and inspected by D&C Fire Protection, Inc. (D&C) of Lithonia, Georgia.

The October 6, 2011 fire caused more than 120 ceiling level sprinklers to open and discharge water over more than 11,000 ft.² of the plant's floor area. This number of operating sprinklers far exceeds the design basis/assumption of approximately 15 sprinklers operating over a design area of 1950 ft.². The ceiling sprinklers were 155° F, quick response sprinklers.

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Seneca Fire Engineering, LLC was retained to review the circumstances of the fire at Gwinnett Clean & Beautiful with a focus on the performance of the installed fire sprinkler system. This Summary Report has been prepared to summarize the results of this review to date.

In preparing this report, I have reviewed certain currently available documents and information including drawings, reports, photographs, permits, inspection reports, codes and standards and other related documents. A listing of documents reviewed to date is provided in Appendix A. I also visited the loss site to inspect the sprinkler system and meet with plant representatives on October 17, 2011 and December 13, 2012.

The content of this report is based on my knowledge, education and experience in fire sprinkler system design and performance, fire protection engineering and related codes, standards and practices. A resume further describing my education, training and experience and a listing of prior testimony is provided as Appendix B.

The observations and opinions expressed are based on information reviewed to date. If additional or differing information becomes available, the opinions expressed may change as a result and the report amended or supplemented.

Background

The Gwinnett Clean & Beautiful recycling facility was constructed in 2008/2009. The following provides a general timeline of the plant's design and construction based on documents available and reviewed to date.

- A building permit was issued by Gwinnett County for the facility on or about 9/19/08.
- Gwinnett Clean & Beautiful issued a Request for Pricing for a Fire Sprinkler System. This request for proposal included Project Specifications, a Scope of Work Narrative and Sprinkler System Design Considerations.
- In response to the Request for Pricing, D&C prepared a proposal dated 11/13/08 for the design and installation of a fire sprinkler system for the facility.

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- Construction drawings dated 11/25/08 were issued for the facility. These drawings included the office areas as Phase 2A/2B and the Sorting/Bailing areas as Phase 3A/3B.
- D&C prepared drawings depicting the design of the fire sprinkler system for the entire facility dated 11/26/08.
- A Temporary Certificate of Occupancy (TCO) (pending Fire Marshal review) was issued on or about 12/17/08.
- On 12/19/08, D&C issued a Change Order Proposal for additional work on the sprinkler system installation including the addition of sprinklers under mezzanine extensions.
- On 1/7/09, the Fire Marshal issued a Temporary Use Permit authorizing the setup of equipment/machinery for test run per verbal directive on 12/17/08.
- Monthly updated TCO's issued by Gwinnett County from 1/17/09 to 8/17/09.
- A final Certificate of Occupancy (CO) was issued by Gwinnett County on 8/18/09.
- On 12/4/09, D&C conducted an annual inspection of the sprinkler system.
- On 12/7/10, D&C conducted an annual inspection of the sprinkler system.

During both the 12/4/09 and 12/7/10 inspection of the sprinkler system, D&C noted that there were "offices (added after installation of sprinkler system) ... not sprinklered and that four (4) sprinkler heads need to be added." As a result of this observation, D&C annotated on the respective inspection forms that the sprinkler system was not extended to all visible areas of the building. However, D&C did not identify the obstructions created by the transfer belt over the Eddycurrent and other obstructed areas present on the operating floor during their inspections.

Fire Sprinkler System

The sprinkler system designed and installed by D&C was a dry pipe system controlled by a Victaulic FireLock NXT dry valve. The system generally consisted of 4-inch feed and cross mains with 1-1/4 inch branch lines. As noted above, the sprinklers installed at the ceiling were 1/2-inch diameter ($K = 5.6$), 155° F, quick response sprinklers. System drawings prepared by D&C indicate a design density of 0.2 GPM/ ft.² over 1950 ft.² (Ordinary Hazard II).

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The D&C proposal states that the system would consist of a "complete "dry pipe" sprinkler system for the Proposed New Facility in accordance with the plans, NFPA No. 13 and the local Fire Marshal." NFPA 13 is the *Standard for the Installation of Sprinkler Systems* published by the National Fire Protection Association (NFPA). At that time, the 2002 edition of NFPA 13 was adopted and enforced by Gwinnett County and the State of Georgia. NFPA 13 provides the minimum requirements for the design and installation of automatic fire sprinkler systems.

The Scope of Work Narrative for the project (D&C00028) states that "the sprinkler system will need to cover the conveyor systems located on top of the mezzanine structures as well as the storage bin/Hopper areas located under the mezzanine structures."

NFPA 13, Chapter 8, *Installation Requirements*, details the requirements for proper spacing, location, and position of sprinklers. The fundamental principles for properly locating fire sprinklers include provisions that sprinklers must be installed throughout and must be positioned/located to provide satisfactory performance with respect to activation time and water distribution.

Section 8.5.5.3 contains some detailed requirements that address obstructions that prevent ceiling level sprinkler discharge from reaching the hazard below. Specifically, Section 8.5.5.3.1 states:

"Sprinklers shall be installed under fixed obstructions over 4 feet (1.2 m) wide such as ducts, decks, open grate flooring, cutting tables, and overhead doors."

As noted above, the subject fire which initially started in the Eddycurrent spread to an area beneath a nominally 5-foot wide transfer conveyor that traversed the Eddy current feed conveyor. This created an obstructed area that prevented ceiling sprinkler discharge from reaching the hazard area below the transfer conveyor. Since the transfer conveyor was greater than 4-feet wide, sprinklers were required in this area per NFPA 13. However, there were no such sprinklers were installed in this area at the time of fire. Due to these missing sprinklers, the fire was allowed to continue to burn/spread within the concealed areas causing severe damage to the transfer belt and related equipment.

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Subsequent to the fire, the Office of the Fire Marshal of Gwinnett County issued a Notice of Non-Compliance identifying this obstructed area (among others) as having inadequate sprinkler coverage per the requirements of NFPA 13 and required that additional sprinklers were installed.

In addition to the clear code compliance issue, the lack of sprinkler protection within the area beneath the transfer conveyor did not meet the scope of work narrative for the project which required that the sprinkler system cover all the conveyor systems located on top of the mezzanine structures.

Based on information currently available and my analysis to date, the lack of fire sprinklers under the nominal 5-foot wide transfer conveyor near the Eddycurrent as required by NFPA 13, the scope of work narrative and D&C's proposal was the principal cause which allowed the fire to spread from the Eddycurrent into the concealed area created by the transfer belt allowing extensive damage to the transfer belt and surrounding equipment. If fire sprinklers had been installed to protect the obstructed areas as required by applicable codes and the scope of work, it is likely that the damage resulting from this fire would have been limited to the Eddycurrent and its associated feed belt.

It was determined that the subject elevated transfer conveyor was installed concurrent with the original construction of the facility. It was not added after D&C's installation of the facility's sprinkler system. The existence of this transfer conveyor is shown on certain original design drawings dated 11/25/08 (Reference Drawing E1.0).

Additionally, the concealed fire that resulted from the non-sprinklered area beneath the transfer conveyor, in combination with the 155° F, quick response sprinklers were the likely cause for the excessive number of opened fire sprinklers at the ceiling.

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Sprinkler System Inspections

Subsequent to receiving the Certificate of Occupancy (8/18/09), Gwinnett Clean & Beautiful retained D&C to conduct required annual inspections of the installed sprinkler system. These inspections are required by the Rules and Regulations of the Georgia Safety Fire Commissioner which state that such inspections shall be conducted in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. D&C conducted these inspections on 12/04/09 and 12/7/10.

NFPA 25 requires that during these annual inspections all installed sprinklers be inspected from the floor level (Reference section 5.2.1.1). Specifically, NFPA 25, Section 5.2.1.2 states that unacceptable obstructions to the spray patterns of installed sprinklers shall be noted and corrected. Section A.5.2.1.2 explains that:

"... Obstructions that prevent sprinkler discharge from reaching the hazard include continuous or non-continuous obstructions that interrupt the water discharge in a horizontal plane... below the sprinkler deflector in a manner to limit the distribution from reaching protected hazard. Specific guidance for clearance and obstructions is found NFPA 13..."

It is clear that NFPA 25 states that obstructions such as that created by the nominal 5-foot wide conveyors should have been identified during D&Cs inspections of the system and remedied prior to the subject fire. While D&C did identify one non-sprinklered area in the facility (4 sprinklers needed in an office area), they did not identify other numerous and obvious obstructions that existed in the plant area.

D&C's failure to identify the obstruction created by the transfer conveyor during their inspections was not consistent with the applicable rules and regulations and was a contributing factor to the obstructions being present at the time of the subject fire. As a result, this fire was allowed to spread to an obstructed area and cause related damage. If the need for these fire sprinklers to protect the obstructed areas had been identified during their inspections as required, the sprinklers could have been added (as was done post-fire) thereby likely limiting the fires damage to the Eddy current and its associated feed belt.

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Summary of Conclusions/Opinions

Based on my review and analysis to date, as described in more detail above, the primary cause for the inadequate sprinkler system performance and resulting damage in this instance was the failure to properly install fire sprinklers beneath the 5-foot horizontal obstruction created by the transfer conveyor near the Eddycurrent in accordance with the requirements of the scope of work for the project, associated design drawings, NFPA 13 and applicable codes and standards. Specifically, D&C failed to provide proper sprinkler coverage beneath required horizontal obstructions in the plant area. As a result, the fire was able to spread uncontrolled beneath these obstructions causing increased damage and sprinkler system operation (excessive open sprinklers). Further, D&C failed to identify these areas during subsequent inspection of the system as required by NFPA 25 and applicable rules and regulations.

If any opinion expressed changes as a result of additional information, the report will be amended or supplemented as appropriate.

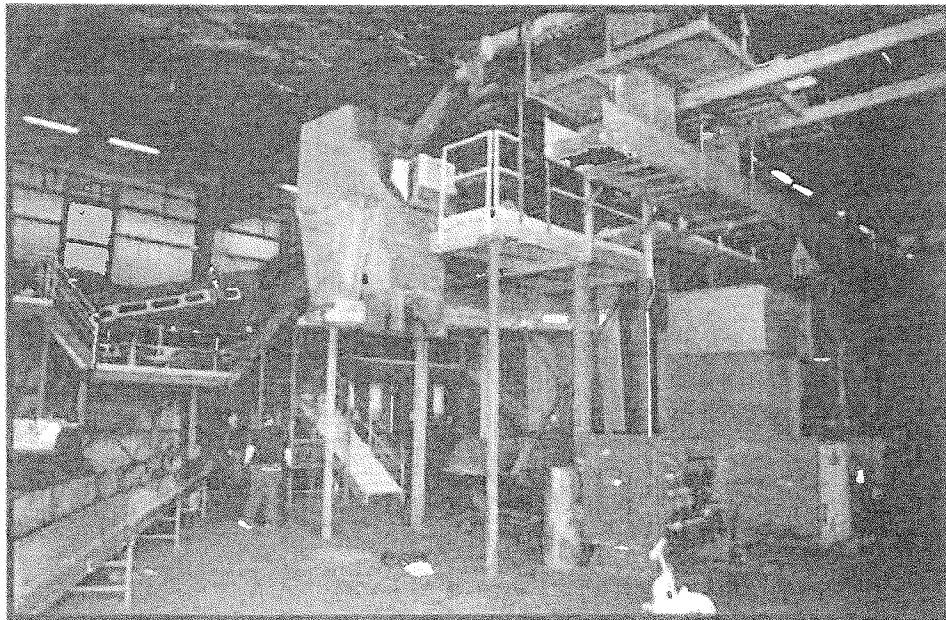
Prepared by:

A handwritten signature in black ink, appearing to read "Daniel L. Arnold", is written over a horizontal line.

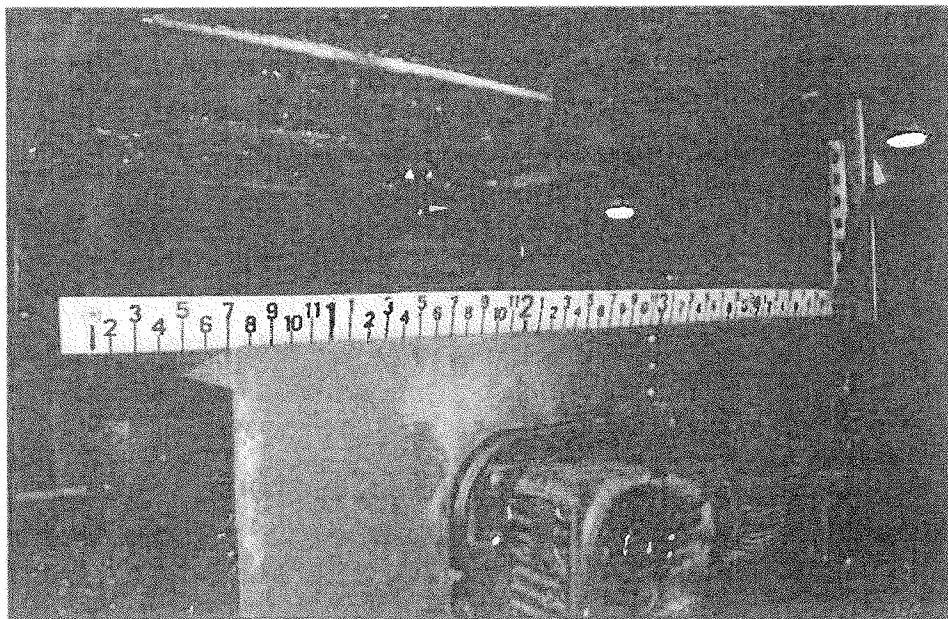
Daniel L. Arnold, P.E., FSFPE

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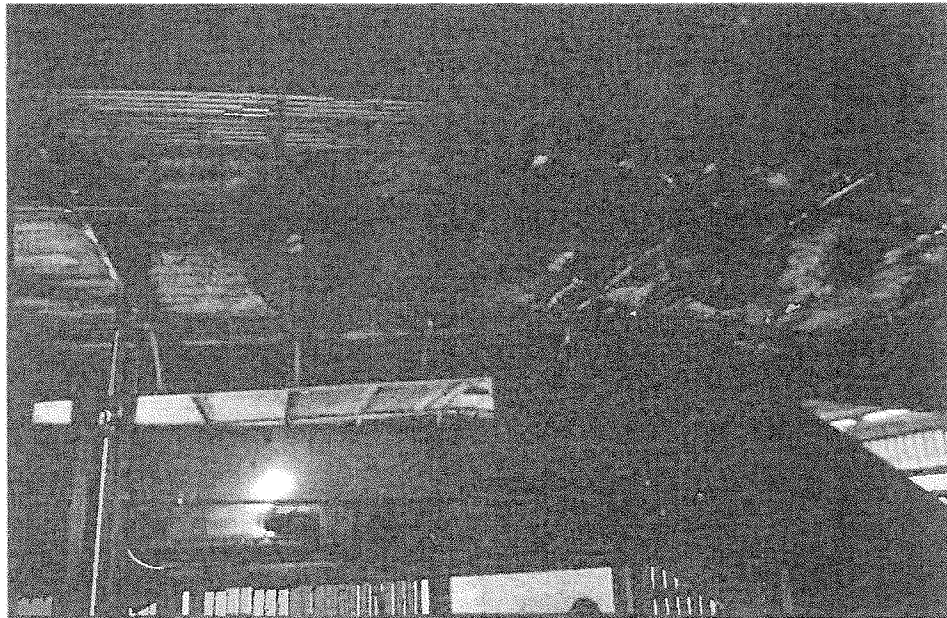
General Area Showing Eddycurrent and Transfer Conveyor



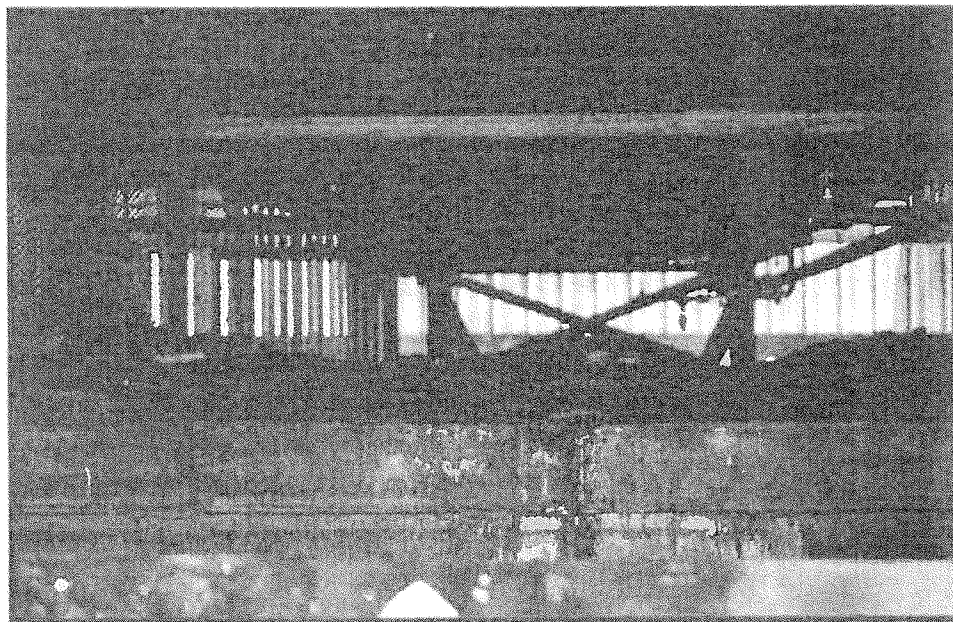
Obstructed Area under Transfer Conveyor at Eddycurrent Feed

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Example Area under Transfer Conveyor
(Note: Sprinklers added after fire)



Example Area under Transfer Conveyor
(Note: Sprinklers added after fire)

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Appendix A

1. Documents produced by D&C Fire Protection, Inc.
2. Documents produced by Gwinnett County Arson & Explosives Unit, Department of Fire and Emergency Services and Gwinnett County Police Department
3. Notices of Non-Compliance (Post-Fire) issued by Gwinnett County Department of Fire and Emergency Services dated 10/6/2011
4. Various permit and certificate of occupancy documents
5. Specifications for Recycling Bank of Gwinnett dated August 18, 2008 prepared by Lindsay, Pope, Brayfield and Associates, Inc.
6. Sprinkler Plans, Recycling Bank of Gwinnett prepared by D&C Fire Protection, Inc. dated 11/26/08 (2 sheets)
7. Marked-up sprinkler plans prepared by D&C Fire Protection, Inc. showing sprinklers to be added beneath obstructed areas (prepared post-fire).
8. Various manufacturers technical product data information
9. Various NFPA codes, standards and other related documents including NFPA 13, *Standard for the Installation of Sprinkler Systems* and NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.
10. Rules and the Regulations of the Safety Fire Commissioner (Chapter 120-3-3), *Rules and Regulations for the State Minimum Fire Safety Standards*
11. Field notes, sketches and photographs.

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Appendix B

DANIEL L. ARNOLD, P.E., FSFPE

EDUCATION:

University of Maryland
Bachelor of Science in Fire Protection Engineering, 1980

**PROFESSIONAL
EXPERIENCE:**

2001 - Present

SENECA FIRE ENGINEERING, LLC, Marietta, GA
Principal Fire Protection Engineer

Consulting fire protection engineer. Fire protection system design and evaluation. Building, fire and life safety code analysis, equivalencies and negotiations. Property fire protection condition surveys and audits. Fire investigation and litigation/expert support services.

1985 - 2001

ROLF JENSEN & ASSOCIATES, INC., Atlanta, GA
Engineering Manager/Vice President

Design, evaluation and consulting fire protection engineering projects. Conceptual planning, design in inspection of fire protection systems including sprinkler, water supply, standpipe, fire alarm, detection and alarm systems. Consult on building code issues related to fire and life safety.

1983 - 1985

BECHTEL CORPORATION, Gaithersburg, MD
Fire Protection Engineer

Consulting engineer in areas of fire protection and mechanical engineering. Implemented fire protection requirements. Performed fire hazard analyses including ensuring compliance with regulatory requirements, postulating fire scenarios and the evaluation of general plant fire safety. Developed conceptual fire protection system design and reviewed existing systems for modifications.

1982 - 1983

ROTHFUSS ENGINEERING CORPORATION
Staff Fire Protection Engineer

Performed fire protection system surveys including as-built system walkdowns, acceptance tests, preparing operation and technical procedures, fire brigade training and fire pre-plan development. Designed fire protection systems including detailed drawing development, water supply system modifications and specifications.